PACCD meeting: LSST update

Andrei Nomerotski

2014/03/17

- ITL sensors

- Sensor simulations

- Integration

LSST Sensors

Science sensors
- – Good prototypes from e2v and ITL, passed FDR
- – First articles ordering in progress

Production in 2015 - 2019
- – Sensor acceptance testing and raft assembly in BNL and LPNHE (Paris)
- – Raft integration in camera cryostat at SLAC

Testing labs: careful characterization of sensors (beyond acceptance testing)
- – BNL (includes raft characterization)
- – Harvard
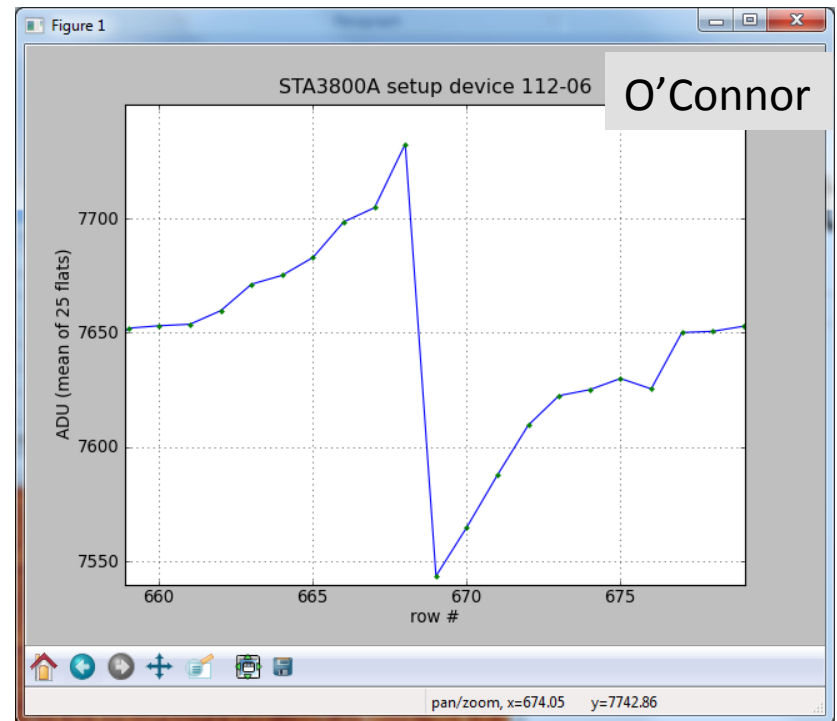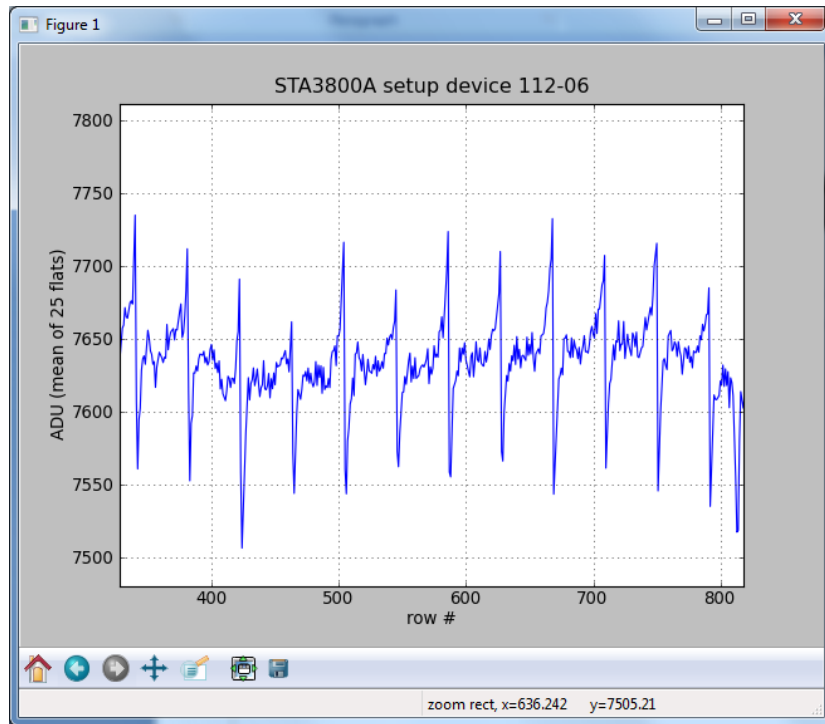- – LPNHE
- – UC Davis

ITL sensors

Received good quality ITL sensors

- – Sensor design/production/packaging chain: ITL → STA → DALSA→ITL
- – Extensively tested in Harvard and BNL

Observing some interesting features

ITL sensors: structures
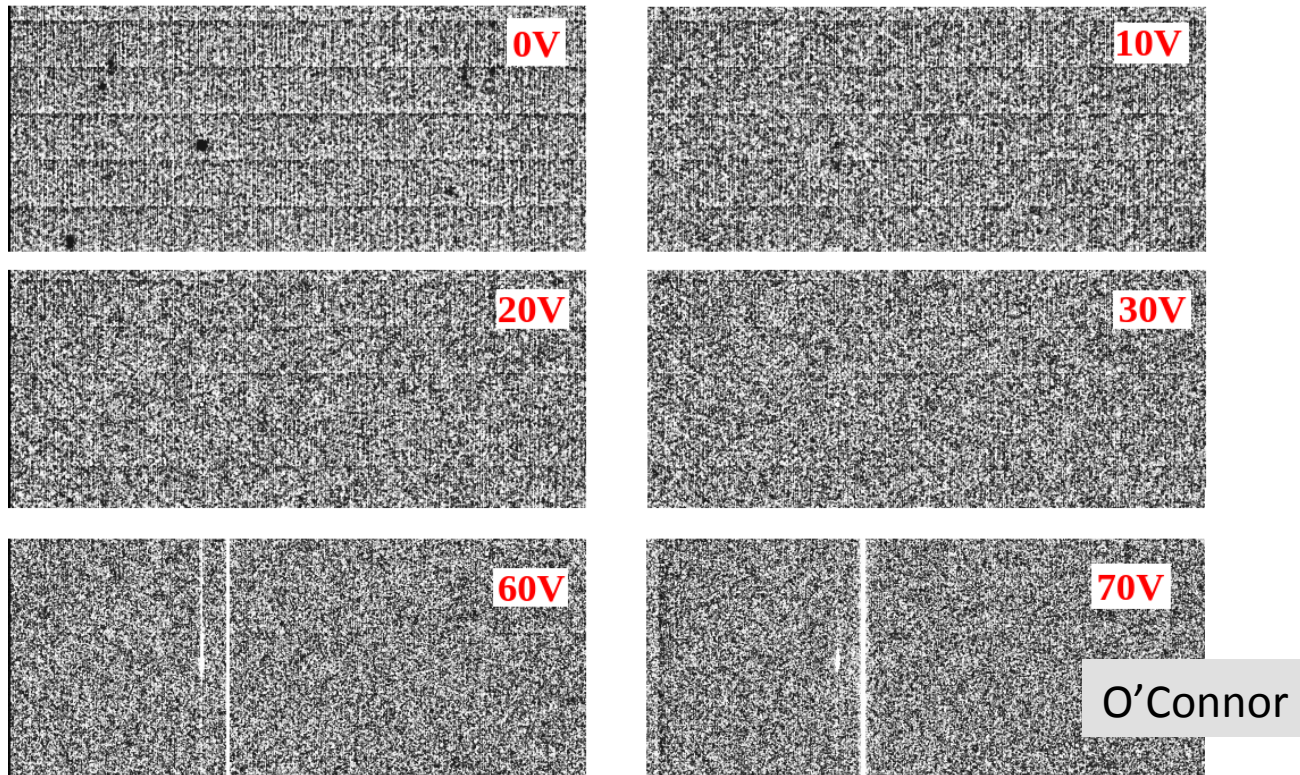

Pixel physical size distortions due to masks?

- Period 41 pixel x 10 micron = 410 micron
- DALSA used electron beam mask writer, could it be DAC differential non-linearity? Old sensors had laser-written mask and did not have this
- Weak dependence on bias, no wavelength dependence

Same effect in DES?

- Same vendor (DALSA)
- 27.333 pixel periodic modulation seen in dome flats
- 27.333 x 15 micron = 410 micron : same period as LSST
- Is it purely photometric?

Chip 53 g flat, median-fold at 82 pix period after flattening

Bernstein
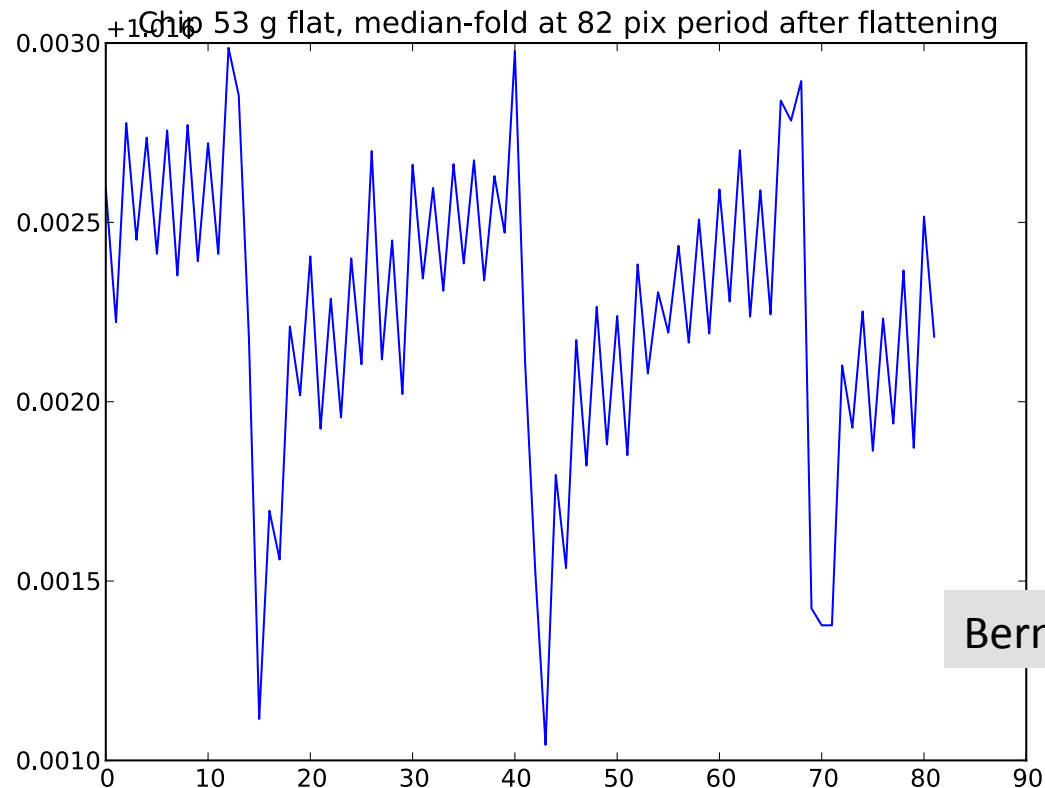
ITL sensors: Bamboo

- Bamboo-like structure at low bias
- May disappear for nominal bias – related to depletion?
- Not visible in UV

LSST: sensor simulations

- We are working on validation of main sensor effects in PhoSim and will propagate this to studies of WL systematics
  - Regular meetings and tutorials (Peterson et al)
    - https://confluence.slac.stanford.edu/display/LSSTDESC/PhoSim+Telecons
  - Tree rings (BNL – Nomerotski & Beamer)
  - Brighter-Fatter effect (Duke – Walter)
  - … long list of other effects

- Simulations of lab setups, comparison to measurements
  - UC Davis LSST simulator in PhoSim (Tyson et al)
  - BNL flats and spot projector

- Use tuned simulations to evaluate sensor effects on science
  - For ex: PSF and astrometric chromatic biases due to sensor effects (tree rings and edges)
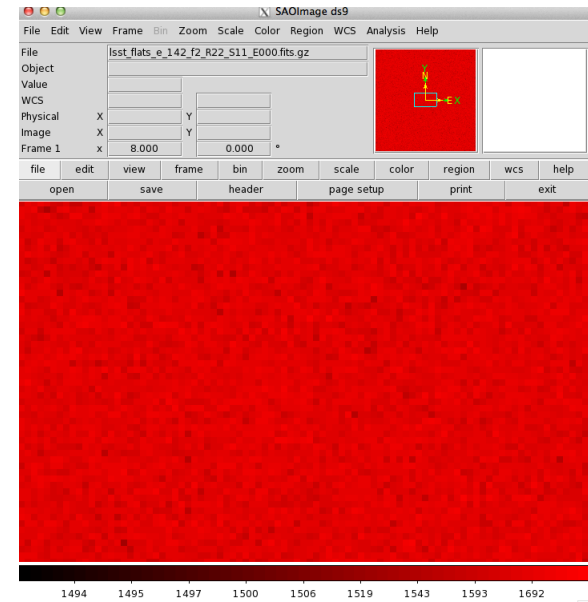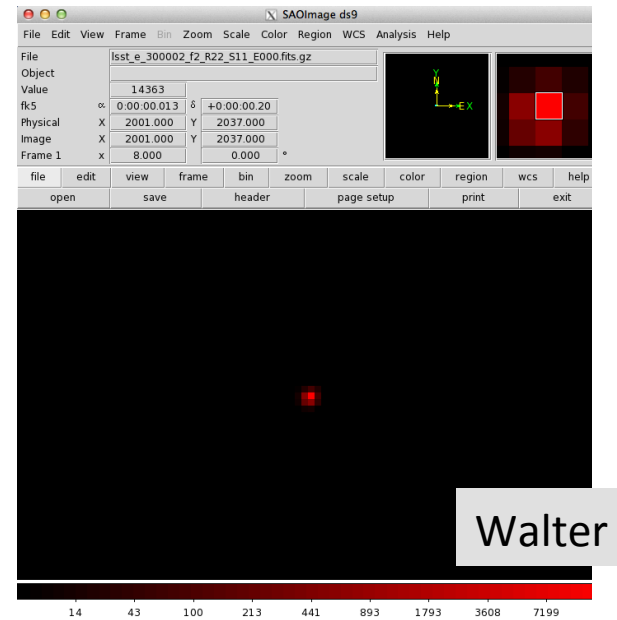
Brighter-Fatter Effect in Simulations

Chris Walter (Duke)

- Validation of charge diffusion and charge sharing models

- Correlations in simulated flats

Next:

- Compare to data

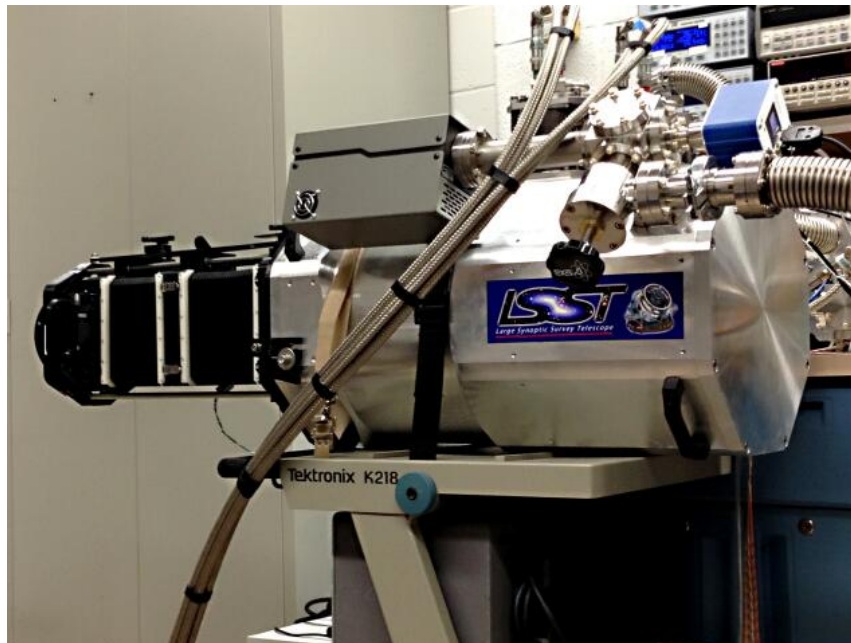- Effects in Photon Transfer Curve

Walter

LSST: Integration of Sensors and Electronics

- Raft test cryostat in operation in BNL
  - So far a single CCD
- Full signal chain from optical input to DAQ
- Separate thermal zones for CCDs and custom electronics
- 9-CCD, 144 Mpix camera – planned as LSST Commissioning Camera 2019-2021
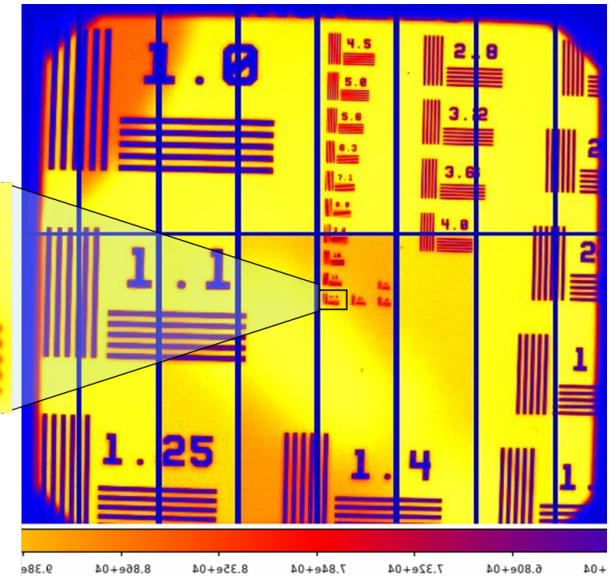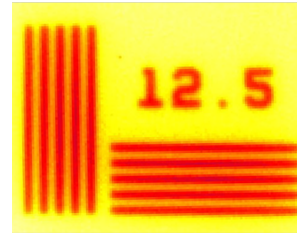
Raft Cryostat

Single-CCD image from Raft Test Cryostat

O'Connor et al